Manual 51-1200
2-27-06

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Because every industry has a leader

S&S Billet Pro Stock Engine Assembly – #31-9710

High-performance off road only!

S&S #31-9710
S&S Billet Pro Stock Engine Assembly – Complete, assembled, and race ready with ignition, fuel injection, and accessories.

Designed by S&S Cycle, Inc. and exclusively distributed and serviced through G2 Motorsports.

DISCLAIMER:

S&S® parts are designed for high performance, off road, racing applications and are intended for the very experienced rider only. The installation of S&S parts may void or adversely effect your factory warranty. In addition such installation and use may violate certain federal, state, and local laws, rules and ordinances as well as other laws when used on motor vehicles used on public highways, especially in states where pollution laws may apply. Always check federal, state, and local laws before modifying your motorcycle. It is the sole and exclusive responsibility of the user to determine the suitability of the product for his or her use, and the user shall assume all legal, personal injury risk and liability and all other obligations, duties, and risks associated therewith.

The words Harley®, Harley-Davidson®, H-D®, Sportster®, Evolution®, and all H-D part numbers and model designations are used in reference only. S&S Cycle is not associated with Harley-Davidson, Inc.

SAFE INSTALLATION AND OPERATION RULES:

Before installing your new S&S part it is your responsibility to read and follow the installation and maintenance procedures in these instructions and follow the basic rules below for your personal safety.

- Gasoline is extremely flammable and explosive under certain conditions and toxic when breathed. Do not smoke. Perform installation in a well ventilated area away from open flames or sparks.
- If motorcycle has been running, wait until engine and exhaust pipes have cooled down to avoid getting burned before performing any installation steps.
- Before performing any installation steps disconnect battery to eliminate potential sparks and inadvertent engagement of starter while working on electrical components.
- Read instructions thoroughly and carefully so all procedures are completely understood before performing any installation steps. Contact S&S with any questions you may have if any steps are unclear or any abnormalities occur during installation or operation of motorcycle with a S&S part on it.
- Consult an appropriate service manual for your motorcycle for correct disassembly and reassembly procedures for any parts that need to be removed to facilitate installation.
- Use good judgement when performing installation and operating motorcycle. Good judgement begins with a clear head. Don't let alcohol, drugs or fatigue impair your judgement. Start installation when you are fresh.
- Be sure all federal, state and local laws are obeyed with the installation.
- For optimum performance and safety and to minimize potential damage to carb or other components, use all mounting hardware that is provided and follow all installation instructions.
- Motorcycle exhaust fumes are toxic and poisonous and must not be breathed. Run motorcycle in a well ventilated area where fumes can dissipate.

IMPORTANT NOTICE:

Statements in this instruction sheet preceded by the following words are of special significance.

⚠ WARNING

Means there is the possibility of injury to yourself or others.

⚠ CAUTION

Means there is the possibility of damage to the part or motorcycle.

NOTE

Other information of particular importance has been placed in italic type.

S&S recommends you take special notice of these items.

WARRANTY:

All S&S parts are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of twelve (12) months from the date of purchase. Merchandise that fails to conform to these conditions will be repaired or replaced at S&S's option if the parts are returned to us by the purchaser within the 12 month warranty period or within 10 days thereafter.

In the event warranty service is required, the original purchaser must call or write S&S immediately with the problem. Some problems can be rectified by a telephone call and need no further course of action.

A part that is suspect of being defective must not be replaced by a Dealer without prior authorization from S&S. If it is deemed necessary for S&S to make an evaluation to determine whether the part was defective, a return authorization number must be obtained from S&S. The parts must be packaged properly so as to not cause further damage and be returned prepaid to S&S with a copy of the original invoice of purchase and a detailed letter outlining the nature of the problem, how the part was used and the circumstances at the time of failure. If after an evaluation has been made by S&S and the part was found to be defective, repair, replacement or refund will be granted.

ADDITIONAL WARRANTY PROVISIONS:

(1) S&S shall have no obligation in the event an S&S part is modified by any other person or organization.

(2) S&S shall have no obligation if an S&S part becomes defective in whole or in part as a result of improper installation, improper maintenance, improper use, abnormal operation, or any other misuse or mistreatment of the S&S part.

(3) S&S shall not be liable for any consequential or incidental damages resulting from the failure of an S&S part, the breach of any warranties, the failure to deliver, delay in delivery, delivery in non-conforming condition, or for any other breach of contract or duty between S&S and a customer.

(4) S&S parts are designed exclusively for use in Harley-Davidson® and other American v-twin motorcycles. S&S shall have no warranty or liability obligation if an S&S part is used in any other application.

PROVEN S&S PERFORMANCE®

Because every industry has a leader

Designed by S&S Cycle, Inc. and exclusively distributed and serviced through G2 Motorsports.

S&S® has teamed up with G2 Motorsports to offer a complete engine package for use in NHRA Pro Stock Motorcycle and AHDRA Pro Gas classes.

G2 Motorsports, Inc. was formed by George Bryce of Star Racing and S&S's own George B. Smith to combine their talents and work with S&S Cycle. The team worked with S&S to develop, test, and make available, high performance engine packages that are competitive at the highest levels and readily attainable for our most discerning and demanding customers!

S&S BILLET PRO STOCK ENGINE 31-9710

The S&S Billet Pro Stock is the same engine you've seen used in competition at NHRA and AHDRA races. It is a 160-cubic inch four cam, 60 degree V-Twin pushrod engine. It is built with special S&S billet crankcases, cylinders, and heads, and features an integral 6-speed automatic transmission. Dual downdraft manifolds and large diameter throttle bodies for S&S Variable Fuel Injection (VFI) and MSD MC-4 Systems are standard on this engine.

- 160ci four-cam, 60 degree pushrod V-Twin
- Billet crankcases with integral transmission housing
- Billet steel Pro Stock style flywheel assembly
- Billet aluminum rods with 1.500" crankpin
- Billet Pro Stock cylinder heads
- Pro Stock VFI manifolds, throttle bodies & S&S ProTune Fuel Injection
- Six-speed automatic transmission
- Includes ignition system, oil pump, pulleys, VFI System, clutch assembly, and final drive sprocket

ACCOMPLISHMENTS

2004

- Won NHRA's "Best Engineered Vehicle Award"
- Qualified #1 and set a track record at Indianapolis Raceway Park with a 7.115 ET
- Won at Las Vegas "The Strip" with a 7.191 ET 179.92 mph
- Qualified #1 and also set a track record at Pomona Raceway with a 7.024 ET

2005

- Chip Ellis won Chicago and Vegas (again) and finished 5th in national points.
- Ryan Schnitz won Denver, Columbus and the finals in Pomona and finished 4th in national points.
- Matt Smith, riding original G2 S&S Pro Stock powered bike "Rattletrap," posted the 3rd quickest pass in NHRA history at 7.000 ET and 189 MPH.
- Every race had S&S Pro Stock teams in the 16 bike field on Sunday.

RIDERS/TEAMS USING THE S&S BILLET PRO STOCK ENGINE

Marco Andreano - Vroom Racing
Tom Bradford - Hal's H-D V-Twin
Connie Cohn - CC Rider Racing
Chip Ellis - G2 Motorsports
Dave Feazell - Two Wheel Travel
Matt Guidera - Rocklin Motorsports
Ronald Mac Phee - Hog Farm Racing
Chris Rivas - Mohegan Sun Racing
Ryan Schnitz - Team Muzzy
Matt Smith - G2 Motorsports
Tom Sorensen - MCPARTS - Denmark
Brett Stevens - Brett Stevens Racing - Australia

SPECIFICATIONS AND OTHER INFORMATION

GENERAL SPECIFICATIONS

Crank Position Sensor Gap **0.0300**
Intake Rocker Arm Ratio **2:1**
Exhaust Rocker Arm Ratio **1.85:1**
Primary Drive Ratio, 64-87 ..... **1.359:1**
Transmission High (6th) Gear Output Ratio **1.053:1**
Drive Sprocket 16 Teeth 6-30 Chain x 43T Wheel **2.688:1**
15 Teeth 6-30 Chain x 43T Wheel **2.867:1**
Overall Drive Ratio, 41T– 46T, 43 Average **3.847:1**
Normal Piston Size ..... **5.1100" - 5.115"**
Piston Fitment ..... **0.0065" - .0072"**
Top Ring Gap ..... **0.023"**
2nd Ring Gap ..... **0.063"**
Oil Ring Gap ..... **0.070"**
Valve Stem to Rocker Arm Clearance (Cold) ..... **0.004"**
(Hot) ..... **0.015"**
Valve Stem to Guide Clearance ..... **0.00175" - .0020"**
Cam End Play ..... **0.010" - .020"**
Anticipated Valve lift; Intake ..... **1.000"**
Exhaust ..... **0.925"**

TORQUE SPECIFICATIONS:

Head Bolt ½" ..... **60 ft-lb**
Head Bolt ⅜" ..... **35 ft-lb**

See Diagram 1.

CYLINDER HEAD – TOP VIEW

TORQUE SEQUENCE DIAGRAM

All nuts to 30 ft-lb ½" first –
then ⅜" – next all ½" to 60 ft-lb –
then all ⅜" to 35 ft-lb.

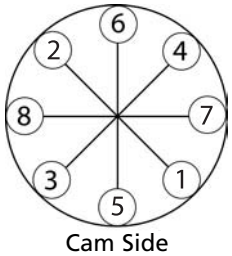


Diagram 1

Rocker Arm Stand Bolts ..... **60 ft-lb**
Use 272 red Loctite—requires TP55 Torx Plus wrench
Rocker Arm Screws ..... **28 ft-lb**
Use 272 red Loctite—requires TP45 Torx Plus wrench
Timing Cover Screws ..... **120 in-lb**
Use 242 blue Loctite.
Bolts 5/16" ..... **18 ft-lb**
Screws ¼" ..... **156 in-lb**

Pinion Gear Nut .....**90 ft-lb**
Use 609 green Loctite liberally on gear and nut--especially on nut face.

Cam Gear Nut .....**90 ft-lb**
Use 609 green Loctite liberally on gear and nut threads and face.

Transmission Trap Door and Case Bolts.....**18 ft-lb**
Use 272 red Loctite

Left Side Main Bearing Nut - coat threads lightly with non-setting thread sealer such as Loctite 592 and torque with S&S Wrench (PN 53-0211) to **125 ft-lbs**.

EXHAUST PIPES

Front & Rear Cylinders
Section 1, 2-3/8" O/D X 7-1/2" long
Section 2, 2-1/2" O/D X 1-1/4" long
Section 3, 2-3/4" OD X 4-3/4" long
Section 4, 3" O/D X 12" long

LUBRICATION

- Engine Oil - 0 or 5wt, 1-1/2 quarts
- Transmission and Primary Lube - 75w90, 2 ounces in primary, fill transmission fluid level to overflow hole, 12 to 14 ounces
- There is a .030 restrictor installed in the oil line that feeds the bottom end – check it often to ensure that it is free of debris
- There is a .015 restrictor in the left main bearing oil feed line – check it often to ensure it is free of debris
- Oil lines must be made from -4 AN braided hose

S&S VFI FUEL INJECTION

Please use -6 high pressure hose to plumb the VFI system.

Anyone purchasing and using the S&S Billet Pro Stock Engine is expected to attend S&S Fuel Injection School to learn the procedures for operation and tuning the S&S VFI Pro Tune II module. G2 will supply the latest version of the most successful map as a starting point for proper initial operation.

IGNITION SYSTEM

Ignition Timing - Set dynamic timing at 30 degrees BTDC-
DO NOT use more than 31.5 degrees at any time.

Timing Instructions - The following are instructions how to statically and dynamically time your engine using the MSD Programmable MC-4 Ignition Control. First, familiarize yourself with the MSD instruction sheet provided with the MC-4 ignition control. The following summarizes how to static time the front and rear cylinders.

1. Load the appropriate MSD MC-4 file for the configuration of your motor/motorcycle. This should be coordinated with G2 Motorsports.
2. Disconnect all wires leading to the coils to prevent accidental misfire. Also, disconnect the clutch switch at this time.
3. With the MC-4 box plugged in, roll the engine over while simultaneously watching the crankshaft degree marks through the primary and the red LED on the end of the MC-4. When the red LED is illuminated, record the crankshaft degrees BTDC. Adjust the ignition pickup plate until it reads 38 degrees BTDC for the front cylinder.
4. Repeat the process for the rear cylinder – rotating the rear pickup for the rear cylinder instead of rotating the ignition pickup plate as in the front cylinder. **(See Diagram 2)**

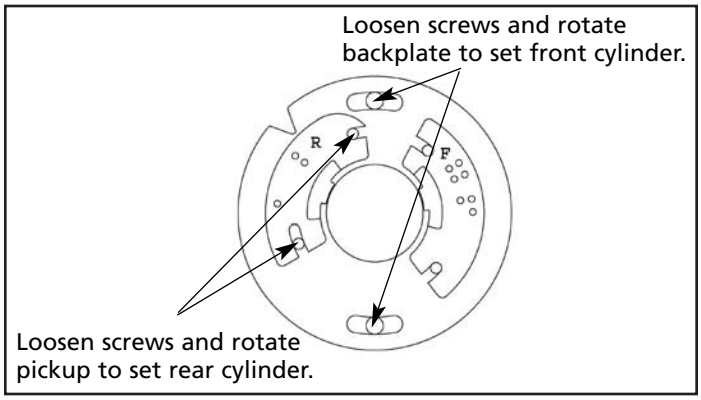


Diagram 2

5. Verify the "Run Timing Curve". Under the "View" Menu select "Plot #1" to display the Run Timing Curve. The MC-4 ignition box automatically subtracts 4 degrees from the static timing number. In addition, from the "Run Timing Curve Screen", specify the degrees of advance to subtract from the static timing number.
6. For example, if the timing curve is a straight line from 1,000 RPM to 10,000 RPM at 4 degrees, the final dynamic ignition advance will be 38 degrees minus 4 degrees (which is automatically subtracted), minus 4 degrees from the "Run Timing Curve Screen". The final dynamic timing is 30 degrees BTDC.
7. Validate the dynamic timing with a timing light at 4000 rpm. Loosen screws and rotate backplate to set front cylinder. Loosen screws and rotate pickup to set rear cylinder.

STARTING PROCEDURE

Due to the large displacement and high compression of this engine, it is important to make sure the front piston is just past TDC on the compression stroke before starting. This gives the starter a chance to get the crankshaft turning before it has to push the engine through a compression stroke.

1. Make sure the ignition switch is turned off.
2. Remove the timing plate in the primary cover.
3. Use a 3/4" RATCHET handle and a short extension if needed, insert extension into the engine sprocket and turn the engine counter clockwise (forward) until it rolls over TDC. The compression will make it snap over TDC with some force.
4. Check in the timing window to be sure the front cylinder is at TDC. You may have to turn the engine clockwise (backward) slightly to see the timing mark.
5. If the front TDC timing mark (TF) is visible, the engine is ready to start. If the rear TDC mark (TR) appears in the window, repeat the above procedure.
6. Mark the oil pump pulley for future reference. This eliminates the need to remove the timing window.

MAINTENANCE TIPS

VISUAL INSPECTION AFTER EACH RUN

- Moly valve coating for cracking or flaking
- Bottom spring collar for cracks.
- Valve tips, lash caps
- Pushrod ends and rocker cups
- Top collar and keepers for excessive wear
- Check valve spring pressure - replace or shim if below 380 lbs. NOTE: Must maintain .060 minimum before coil bind at maximum lift. Recommend replacement of questionable springs rather than shim.
- Drain and inspect oil and if necessary, pull pan and check for debris. If OK, oil may be re-used.

VISUAL INSPECTION AS NECESSARY DURING EVENT

Cylinders/Pistons

- Check wristpin for straightness and coating integrity
- Visually inspect for cracks or signs of scuffing
- Verify ring land straightness
- Check piston domes for signs of detonation

Crankshaft

- Check rod side clearance against build sheet
- Visually inspect crankpin weld
- Visually inspect pinion shaft weld
- Check drive hub and pinion shaft runout – max is .007"

Cam Chest

- Inspect cam gears and keys
- Inspect cam shafts for excess wear and cracked welds
- Inspect tappets and tappet blocks for wear or bad bearings

REBUILD/REPLACEMENT SPECIFICATIONS

Heads

- Run out of valve, service limit is .005 T.I.R.
- Run out of seat, service limit is .005 T.I.R.
- Valve stem wear, service limit is .310 intake, .3105 exhaust
- Measure spring clearance to coil bind, service limit .060 or greater
- Measure spring installed pressure, service minimum is 380 lbs
- Set valve lash cold at .004, lash hot at approx. .015"
- Replace valves at 50 runs or sooner if necessary
- Replace valve springs at 15 runs or sooner if necessary
- Replace rocker arms at 50 runs or sooner if necessary

Cylinders/Pistons

- Measure piston/cylinders for fitment, service limit is .0095
- Measure piston ring land lateral clearance, service limit is .001 1st, .002 2nd
- New ring installation gaps .023, .063, .070
- Measure cylinders, service limit is 5.125"
- Hone cylinder as necessary without exceeding service limit for fitment
- Replace piston if collapsed, service limit is .002 smaller than specification on original build sheet
- Check wristpin/piston fitment, service limit is .002
- Replace pistons at 50 runs or sooner if necessary

Crankshaft

- Check rod side clearance against build sheet
- Visually inspect crankpin weld
- Visually inspect pinion shaft weld
- Drive hub and pinion shaft runout not to exceed .007
- Replace main bearing on crankshaft every 20 runs
- Replace the pinion bearing every 40 runs
- Replace crankshaft at 50 runs or sooner if necessary

Cam Chest

- Tappet blocks and lifters, service limit is .0040 maximum
- Inspect cam gears and keys
- Inspect cam shafts for excess wear and cracked welds
- Inspect tappets and tappet blocks for wear or bad bearings
- Replace cams at 50 runs or sooner if necessary
- Replace lifter at 50 runs or sooner if necessary
- Replace pushrods at 50 runs or sooner if necessary

Transmission

- Replace transmission bearings as necessary or after failure of any transmission component
- Replace shift forks after backing out of any gear except sixth or if routine inspection shows sign of wear
- Replace shift drum after backing out of any gear except sixth or if routine inspection shows sign of wear
- Replace detent arm spring as necessary
- Replace shift pawl as necessary

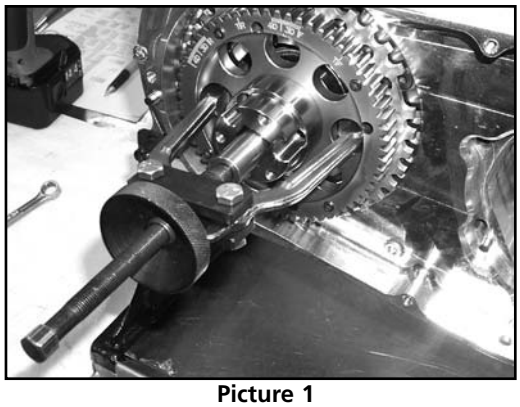
Oil Pump

- Replace pump if gears/rotors are scored or as necessary
- Replace pump belt if edges fray or contaminated by oil, etc.

REPLACING THE DRIVE SIDE CRANK MAIN BEARING

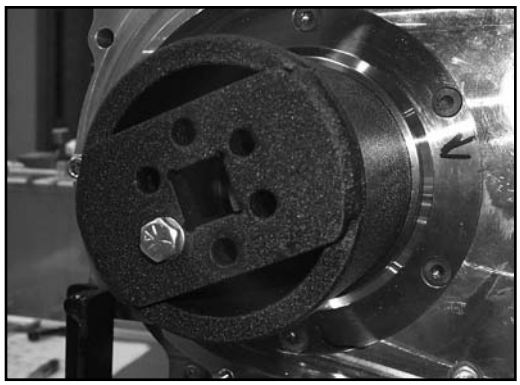
It is recommended that the left (drive side) main bearing be replaced during normal engine teardown maintenance. In the event that you find signs of premature bearing failure and do not have time to tear the engine down, the following procedure has been used for bearing changes in the field. NOTE: This will only work if the bearing is intact.

1. Remove primary cover and oil pan.
2. Remove the three screws holding the starter drive in place.
3. Use puller to remove drive gear and starter hub. **See Picture 1.**



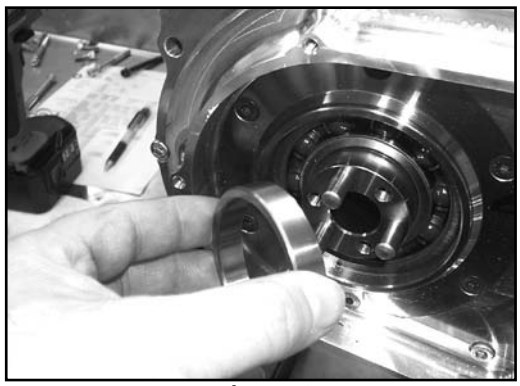
Picture 1

4. Insert lock ring wrench (PN 53-0211) into the lock ring and install the 5/16-24 x 4-1/2" long bolt to securely hold wrench to lock ring. **See Picture 2.**



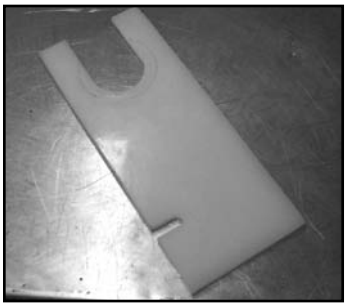
Picture 2

5. With long 3/4" drive breaker bar loosen lock ring (counter clockwise). Move lock ring only enough to loosen and allow removal of 4-1/2" bolt and lock ring.
6. Remove gear to bearing spacer. **See Picture 3.**

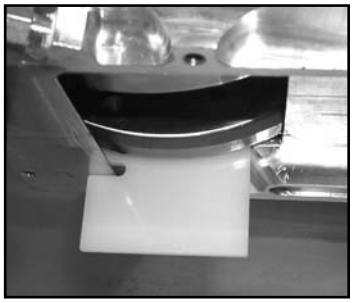


Picture 3

7. Install plastic spacer (PN 53-0450) between the flywheel and cam side case. NOTE: This is important to keep the flywheel assembly from moving over into the intermediate plate bearing and cam cover seal. **See Picture 4 and 5.**

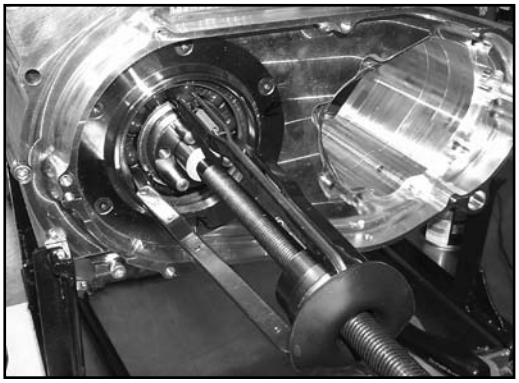


Picture 4



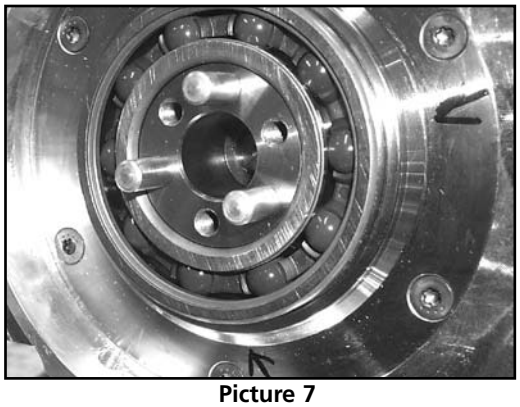
Picture 5

8. Install puller (PN 53-0210) into bearing as shown in photo. Make sure puller arms have the correct spacer to allow the arms to lock into the race. **See Picture 6.**



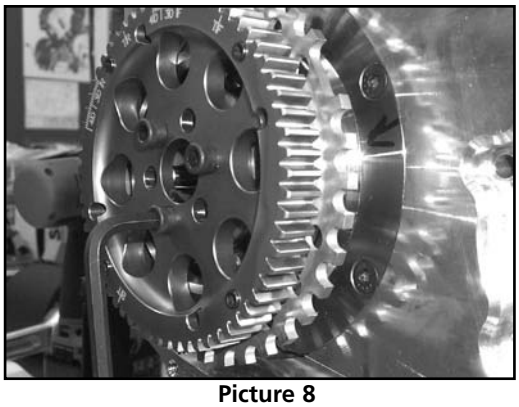
Picture 6

9. Begin pulling bearing. Make sure plastic spacer stays in place during the pulling operation.
10. Once bearing is removed, clean and inspect bore making sure threads are clean and oil supply hole is open.
11. Verify the .100 thick spacer is on flywheel.
12. Put new bearing on flywheel and install as far as you can by hand. Make sure cage is facing in proper direction and apply a light oil or press lube on the bearing outer and inner races before installation. **See Picture 7.**



Picture 7

13. Use the old bearing as a spacer and drive gear as a push tool and put in the 3 screws that hold the starter drive on and begin pulling the bearing in, turning each screw 1/4 turn at a time. NOTE: The primary drive gear will only go on the dowel pins one way. If the screws run out of thread switch to the shorter 5/16-24 screws supplied with the puller and proceed until you feel the bearing seat against the flywheel. **See Picture 8.**



Picture 8

14. Remove the three screws, gear and old bearing.
15. Inspect seal in lock ring (replace if necessary) and install seal lip out.
16. Install bearing to gear spacer ring, using a good oil or press lube on the ring's outer and inner races.
17. Put a light coat of oil on the seal lip and add thread sealer on the threads, such as Loctite 592. Be careful not to get any on the face that contacts the bearing and be sure not to plug the oil feed hole.
18. Thread the lock ring in by hand using caution not to cross thread it. Once the ring contacts the bearing, use the lock ring wrench and a ratchet to tighten the ring until the bearing is fully seated.
19. Use the 5/16-24 x 4-1/2 bolt to hold the wrench tight to the ring and torque the ring to 125 ft-lbs.
20. Install the drive gear and starter drive hub and torque the screws to 18 ft-lbs.

For more information and a full line of parts and support items, contact G2 Motorsports:

Derek Churchwell
G2 Motorsports, Inc.
726 Crisp Drive P.O. BOX 1241
Americus, GA 31709
229-924-0031 Fax: 229-928-2321
g2motorsports@bellsouth.net

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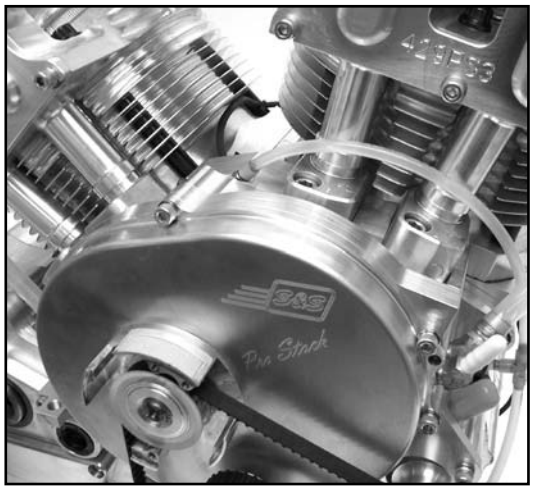
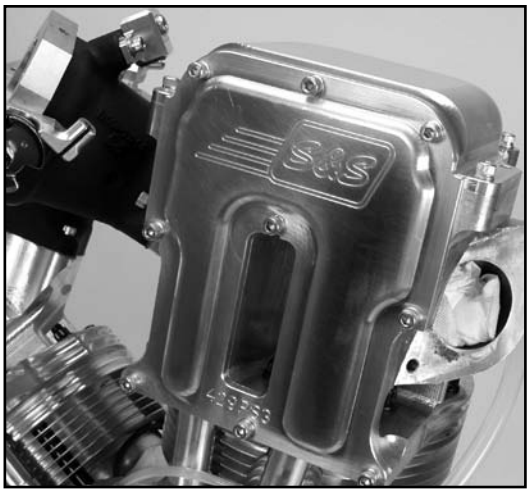




S&S BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

LOWER END PARTS

PRO STOCK CRANKCASE ASSEMBLY

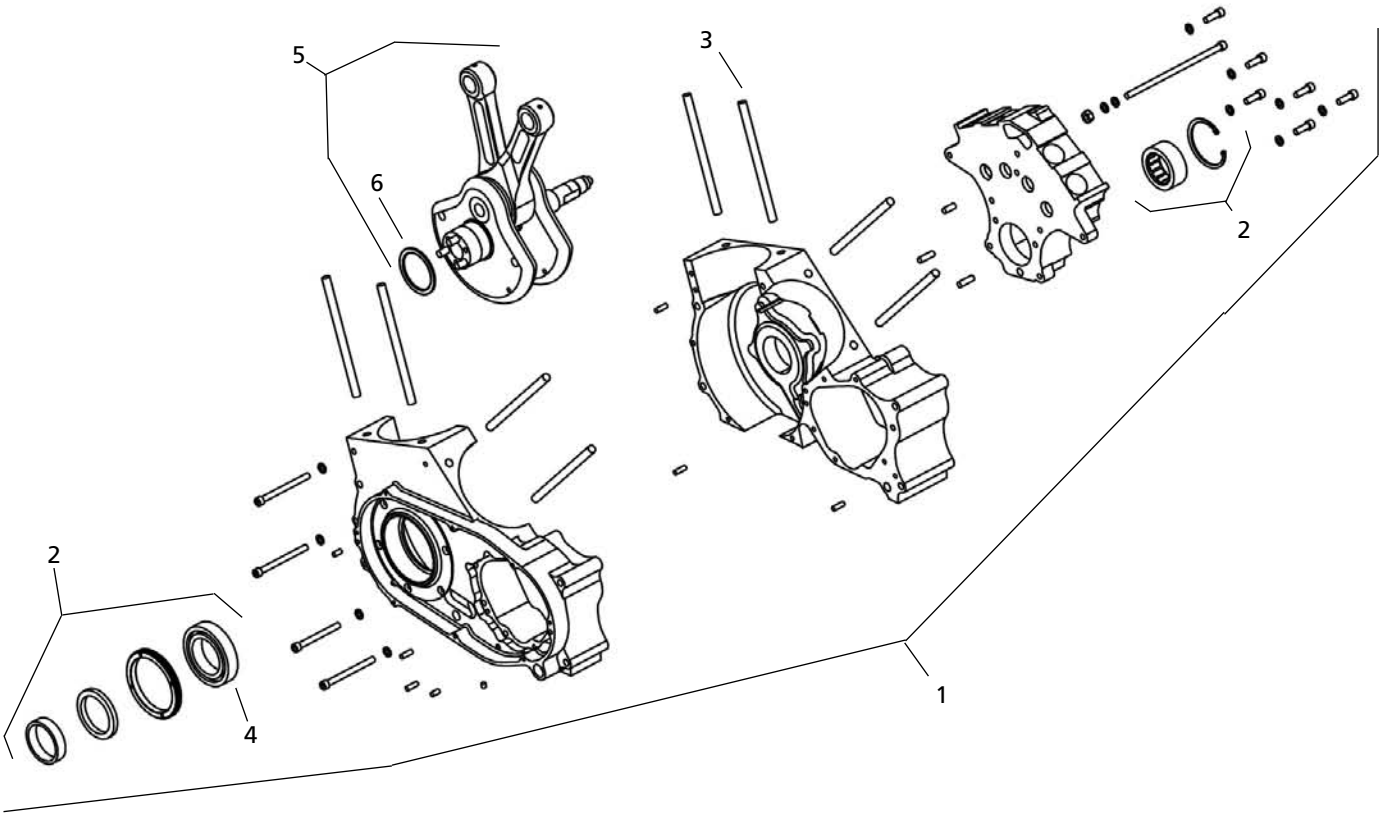
1. Crankcase assembly with cam chest.....**31-1025**
2. Mainshaft bearing rebuild kit **31-4100**
   *(Includes PN 31-4090 and PN 33-4089)
3. Cylinder studs *(8 pack)* **31-2390**
4. Main bearing, drive side **31-4090***
5. Flywheel assembly.....**32-3008**
6. Flywheel to main bearing spacer **50-0367**

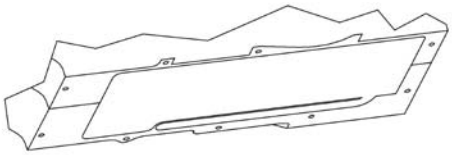
External Starter for S&S Billet Pro Stock Engine
Bulitpruf by FAE –

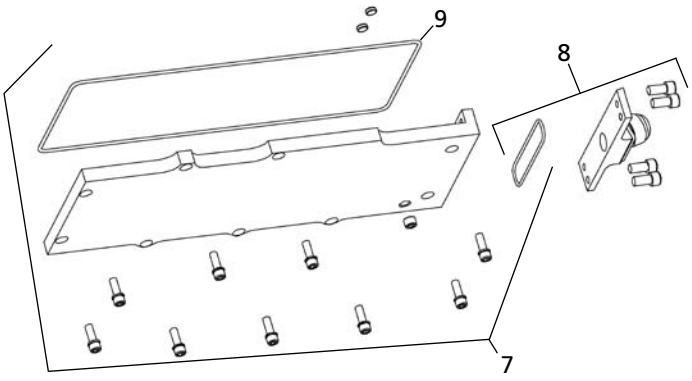
Available exclusively through G2 Motorsports.

G2 Part Number is
BFMC-1 Twin Magnum Starter.

Unit is light weight
with heavy duty power –
two 4½ hp motors, 24 volts.







S&S BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

LOWER END PARTS

PRO STOCK OIL PICK-UP PLATE

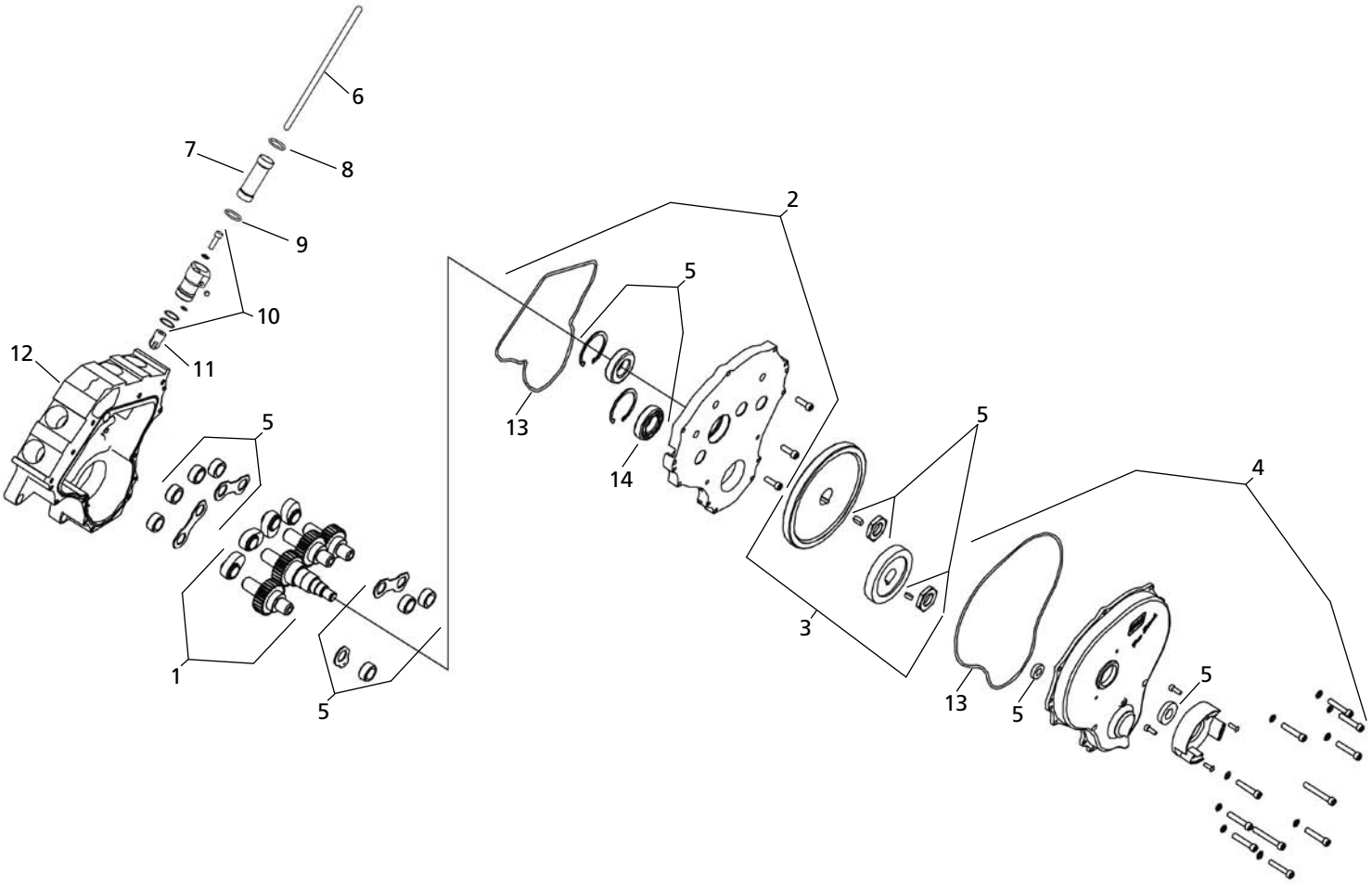
7. Oil pick-up plate with hardware.....**56-5052**
8. Oil adapter fitting with hardware **56-5053**
9. O-ring string 25 ft **50-0402**

BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

LOWER END PARTS

PRO STOCK CAM CHEST

1. Cam set (must be degreed and welded) **33-5196**
2. Intermediate plate assembly **31-6526**
3. Cam pinion/drive gear kit **33-4280**
4. Cam chest cover assembly.....**31-6525**
5. Cam chest rebuild kit **33-1050**
6. Pushrod set *(2 Intake – 2 Exhaust)* **93-5125**
7. Pushrod tube cover set *(4 Pieces)*.....**93-4045**
8. Upper pushrod tube o-ring *(10 pack)* 93-4046
9. Lower pushrod tube o-ring *(10 pack)* **93-4047**
10. Tappet block set *(Front & Rear)* **33-5400**
11. Tappet set **90-4131**
12. Cam chest .....**N/A**
13. O-ring string 25 ft **50-0402**
14. Pinion shaft bearing.....**33-4089***

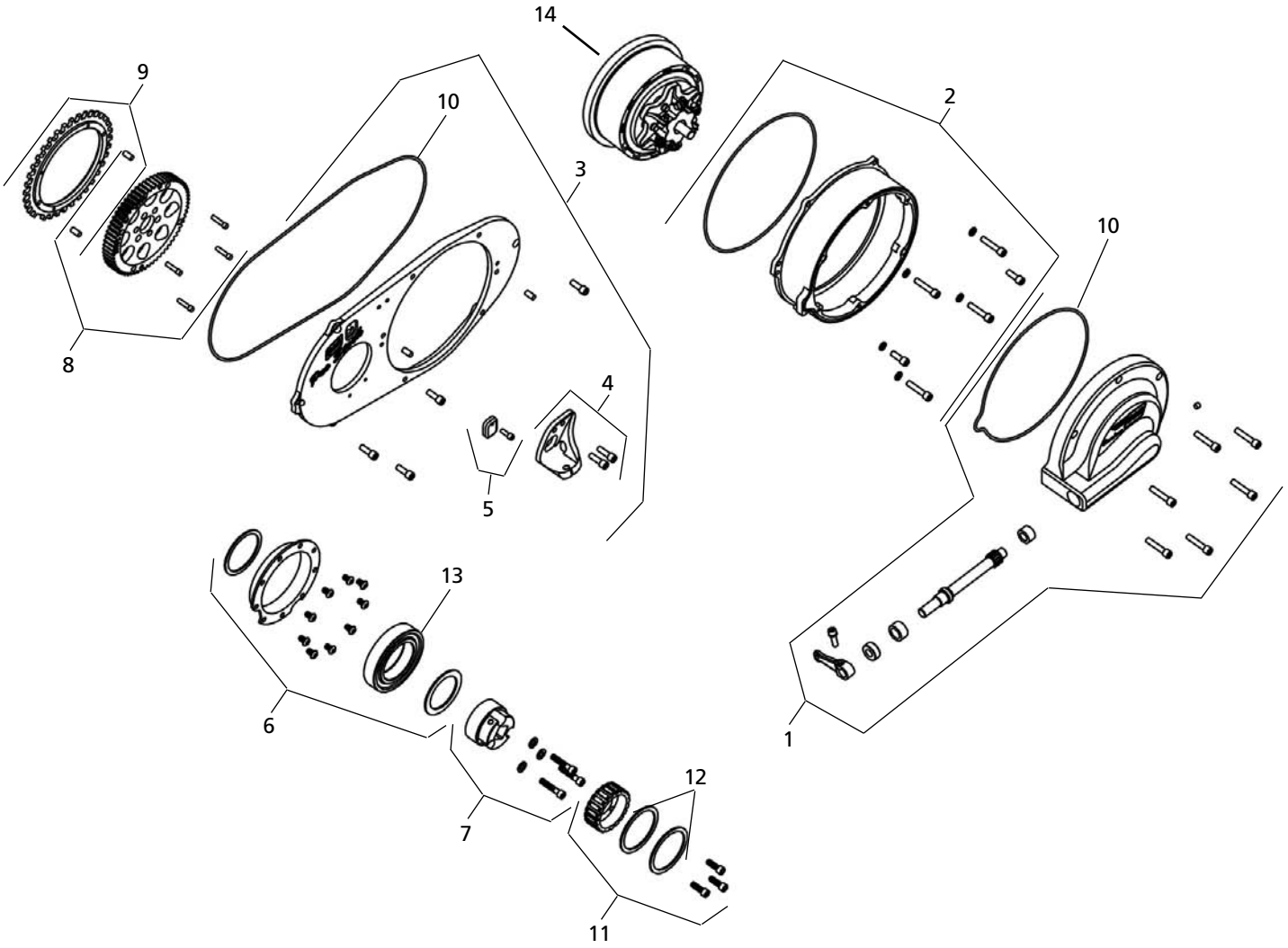


S&S BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

LOWER END PARTS

PRO STOCK PRIMARY COVER

1. Clutch cover with hardware **56-5050**
2. Clutch hub cover spacer kit **56-3039**
3. Primary cover with hardware **56-5051**
4. Clutch cable tab with hardware.....**56-3024**
5. Timing hole cover with hardware.....**31-4099**
6. Outboard bearing support assembly **31-3906**
7. Drive hub with hardware **33-2060**
8. Primary drive gear, 64 teeth, with hardware.....**56-5041**
9. Reluctor wheel with dowel pins **33-2064**
10. O-ring string 25 ft **50-0402**
11. 20 tooth oil pump drive pulley **31-3901**
12. 2 ⅜" external retaining rings.....**50-8341**
13. Outboard support bearing **31-0421**
14. Clutch assembly, 87 teeth **56-3022**



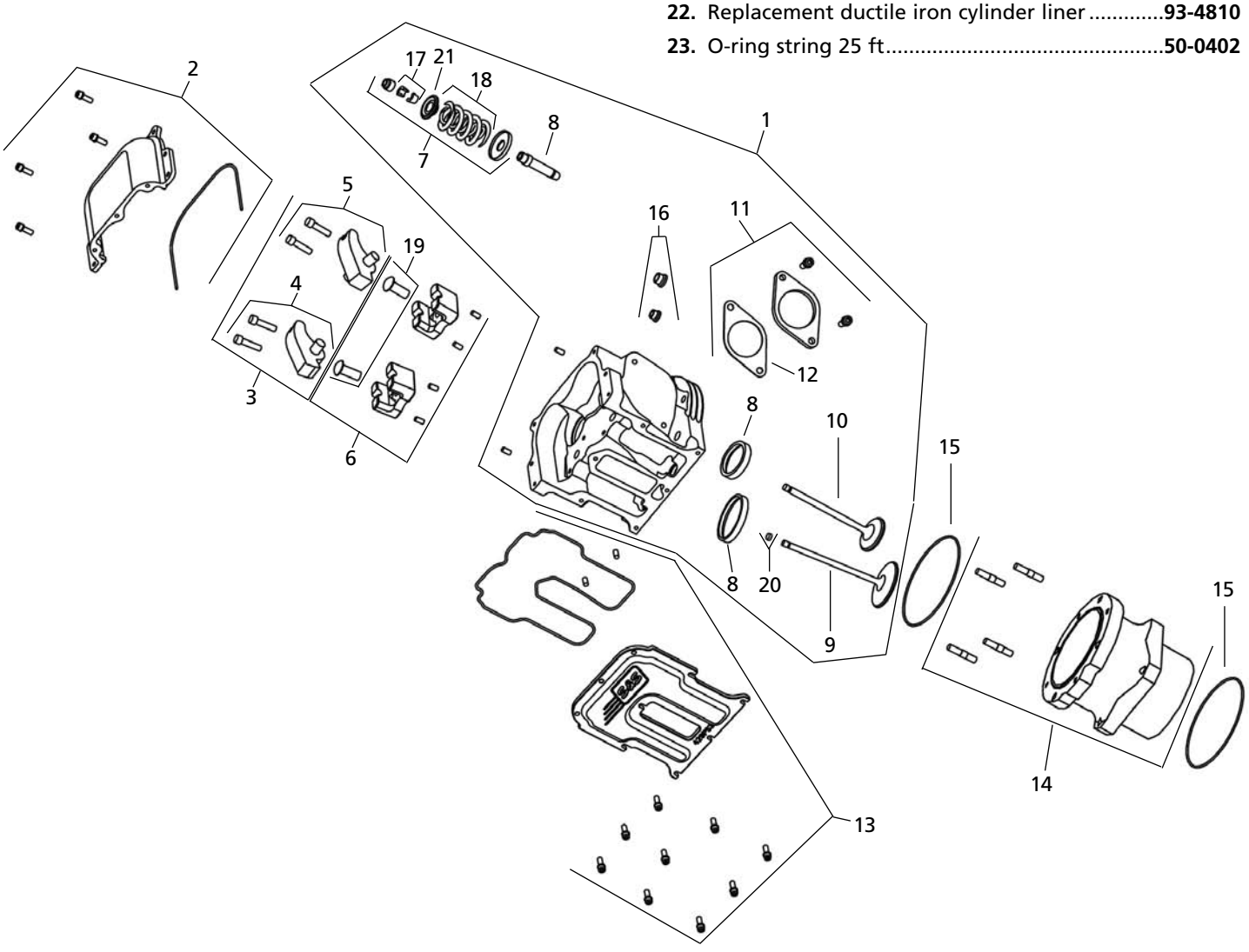
S&S BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

CYLINDER HEADS AND PARTS

PRO STOCK HEAD ASSEMBLY

1. Head Assembly
Front head assembly **90-1465F**
Rear head assembly **90-1465R**
2. Rocker cover with hardware **90-4133**
3. Rocker arm set
Front and rear intake and exhaust **90-4166**
4. Intake rocker arms with hardware
Front and rear **90-4164**
5. Exhaust rocker arms with hardware
Front and rear **90-4165**
6. Rocker arm support set with hardware
Front and rear **90-4162**
7. Valve spring kit – front and rear **90-2290**
8. Seat and guide set – front and rear **90-2180**
9. Intake valve **90-2131**
10. Exhaust valve **90-2132**
11. Exhaust flanges with gaskets and hardware
Front and rear **16-0251**
12. Exhaust flange gasket packet, *(2 pack)* **16-0253**
13. Pushrod cover with hardware
Front **93-4098**
Rear **93-4099**
14. Cylinders
Cylinder set – front and rear without pistons .. **91-4032**
Cylinder set – front and rear with pistons **91-4033**
Front cylinder only **91-4032F**
Rear cylinder only **91-4032R**
15. O-ring, head and base **50-7955**
16. Hardware, cylinder stud, billet PS **50-4000**
17. Keepers, *(8 pack)* **90-2160**
18. Valve springs, *(4 pack)* **90-2291**
19. Button-head cap screw, *(5 pack)* **50-0322**
20. Lash caps *(2 pack)* **90-2166**
21. Titanium top collars, *(4 pack)* **90-2134**

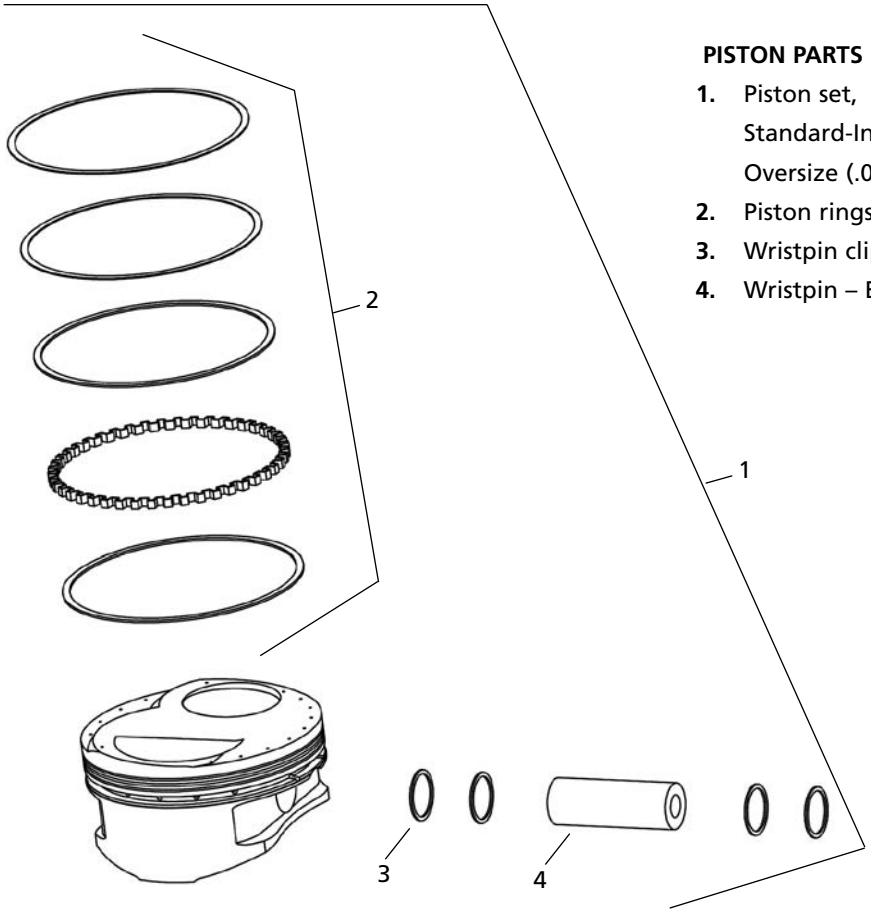
Not Shown:
22. Replacement ductile iron cylinder liner **93-4810**
23. O-ring string 25 ft **50-0402**

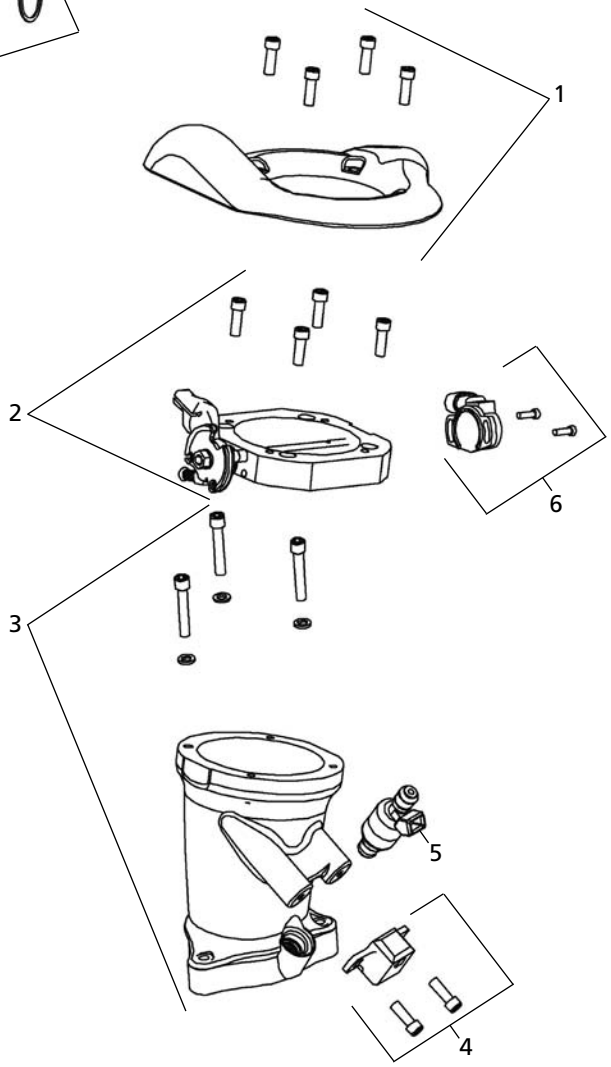


S&S BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

PISTON PARTS

1. Piston set,
Standard-Includes wristpins and rings **92-4925**
Oversize (.005") **92-4926**
2. Piston ringset – For two pistons **94-4400X**
3. Wristpin clips – *(8 Pack)* **94-9276**
4. Wristpin – Each **94-9281**





S&S BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

INTAKE MANIFOLDS AND PARTS

1. Radiused inlet and hardware
Front.....**11-2158**
Rear **11-2159**
2. Throttle body assembly
Front.....**16-5097**
Rear **16-5098**
3. Intake manifold with hardware
Front.....**16-3574**
Rear **16-3575**
4. Injector hat **55-5053**
5. Fuel injector.....**55-5051**
6. Throttle position sensor – Rear manifold only....**55-5036**

S&S BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

MISCELLANEOUS PARTS

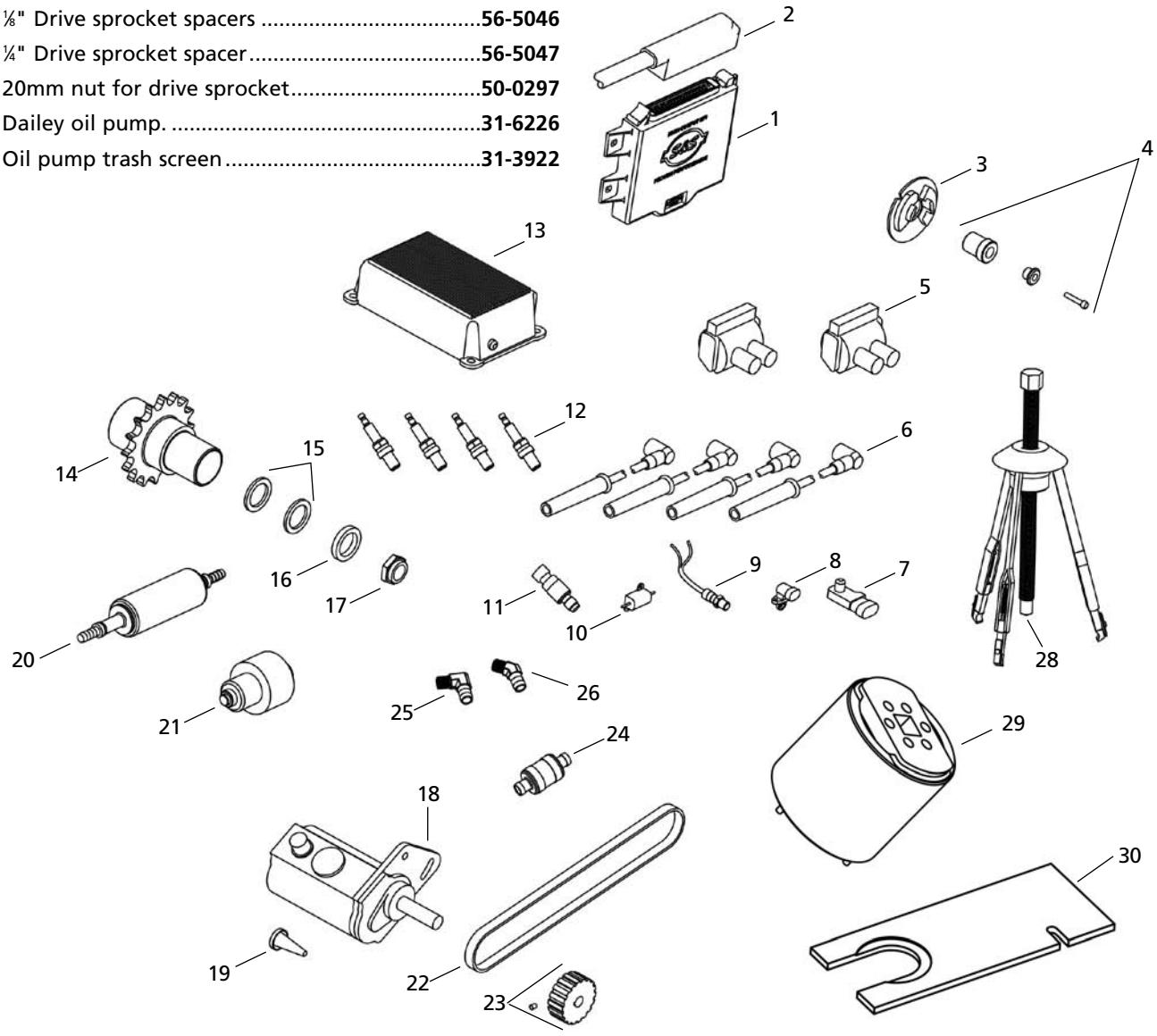
1. S&S VFI module with ProTune II CD **55-5006**
2. Wiring harness, 1995½ - 2001 Magneti module **55-1091**
3. MSD trigger and backplate **55-1206**
4. Rotor, retaining washer and screw **55-1207**
5. MSD coils **55-1575**
6. MSD spark plug wires, 8.5mm (*Set of 4)* **55-1203**
7. Map sensor **55-1037**
8. Air temperature sensor **55-5041**
9. Crank position sensor **31-2090**
10. 10 ohm resistors **55-1566**
11. Head temperature sensor **55-1014**
12. Champion spark plugs (*Set of 4)* **55-1202**
13. MSD MC-4 ignition box **55-1205**
14. Drive sprocket, 16 teeth 6-30 chain **33-4168**
    15 teeth 6-30 chain **33-4169**
15. ⅛" Drive sprocket spacers **56-5046**
16. ¼" Drive sprocket spacer **56-5047**
17. 20mm nut for drive sprocket **50-0297**
18. Dailey oil pump. **31-6226**
19. Oil pump trash screen **31-3922**
20. Fuel pump **50-5042**
21. Fuel pressure regulator **55-5045**
22. 22.5" Oil pump timing belt **31-3921**
23. 18 Tooth oil pump driven pulley with set screw **31-3900**
24. Oil pre-filter, with hardware *(2 pack)* **90-2253**
26. 90° fitting **50-0326**
27. 45° fitting **50-0394**

TOOLS

28. Bearing puller assembly **53-0210**
29. Threaded lock ring removal tool **53-0211**
30. Bearing removal tool spacer **53-0450**

ADDITIONAL PARTS (NOT SHOWN)

- Plug, SH pipe, ⅛-27 npt (10 pack) **50-1015**
- SHCS, ¼-20 x ¾" sems (10 pack) **50-1032**
- O-ring string (25') **50-0402**
- Kit, Seal, Billet Pro Stock Engine **31-7500**
- Kit, Seal, PS Transmission **56-5200**



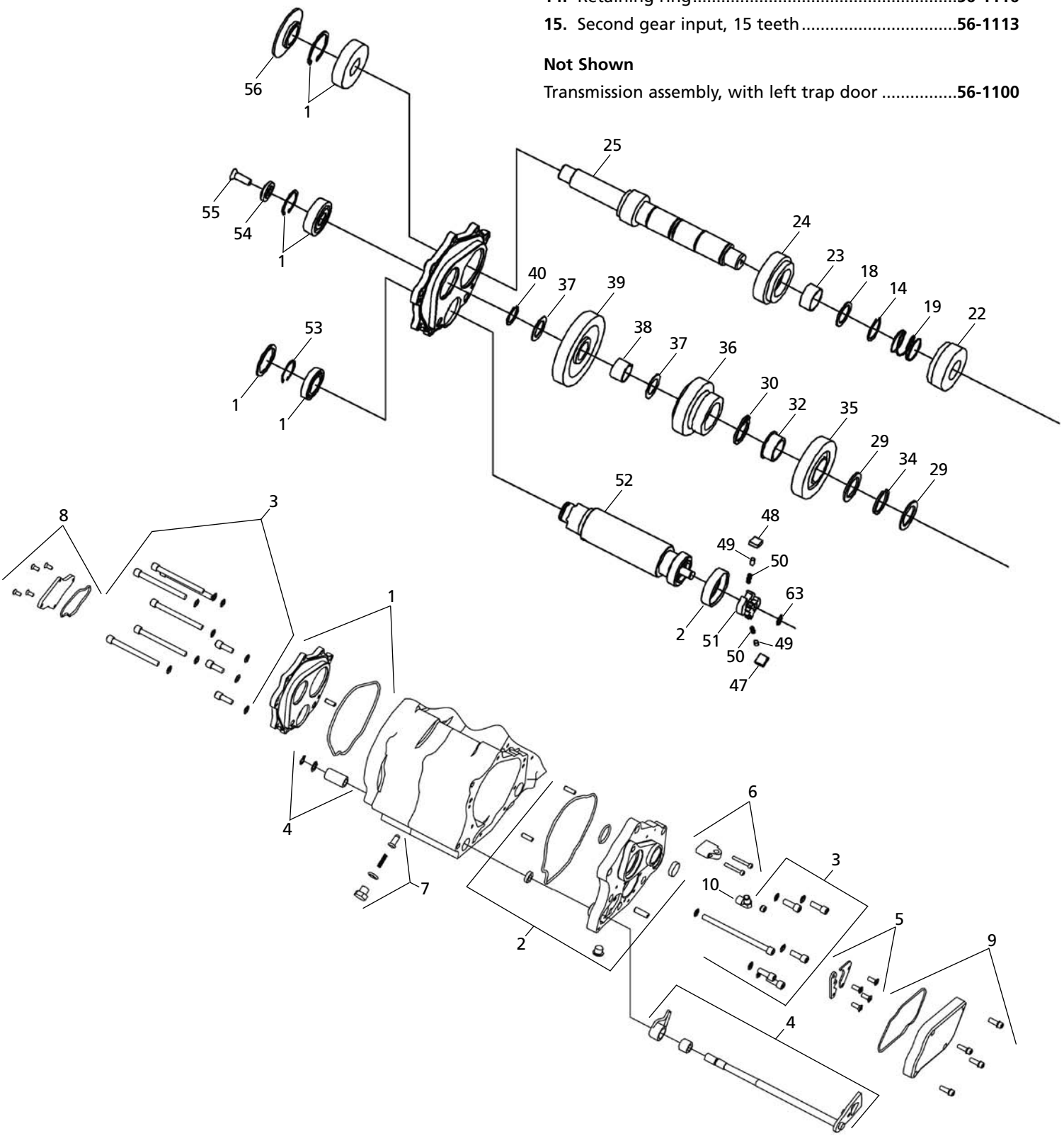
S&S BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

TRANSMISSION PARTS

1. Drive side trap door assembly **56-3010**
2. Right side trap door assembly **31-0405**
3. Transmission hardware kit **56-5059**
4. Gear shift shaft with hardware **56-1114**
5. Shifting-drum and guide-pawl stopper plates with screws **56-5061**
6. Transmission sensor bracket with screws **56-3005**
7. Gear shift cam stopper with hardware **56-5062**
8. Left shifting cover with hardware **31-0402**
9. Right shifting cover with hardware **56-5063**
10. ¼ x ½ 90 degree vent fitting **50-0326**
11. ¼ -28 SHCS **50-0341**
12. Transmission speed sensor magnets **50-5067**
13. Transmission speed sensor rotor **56-3036**
14. Retaining ring **56-1116**
15. Second gear input, 15 teeth **56-1113**

Not Shown

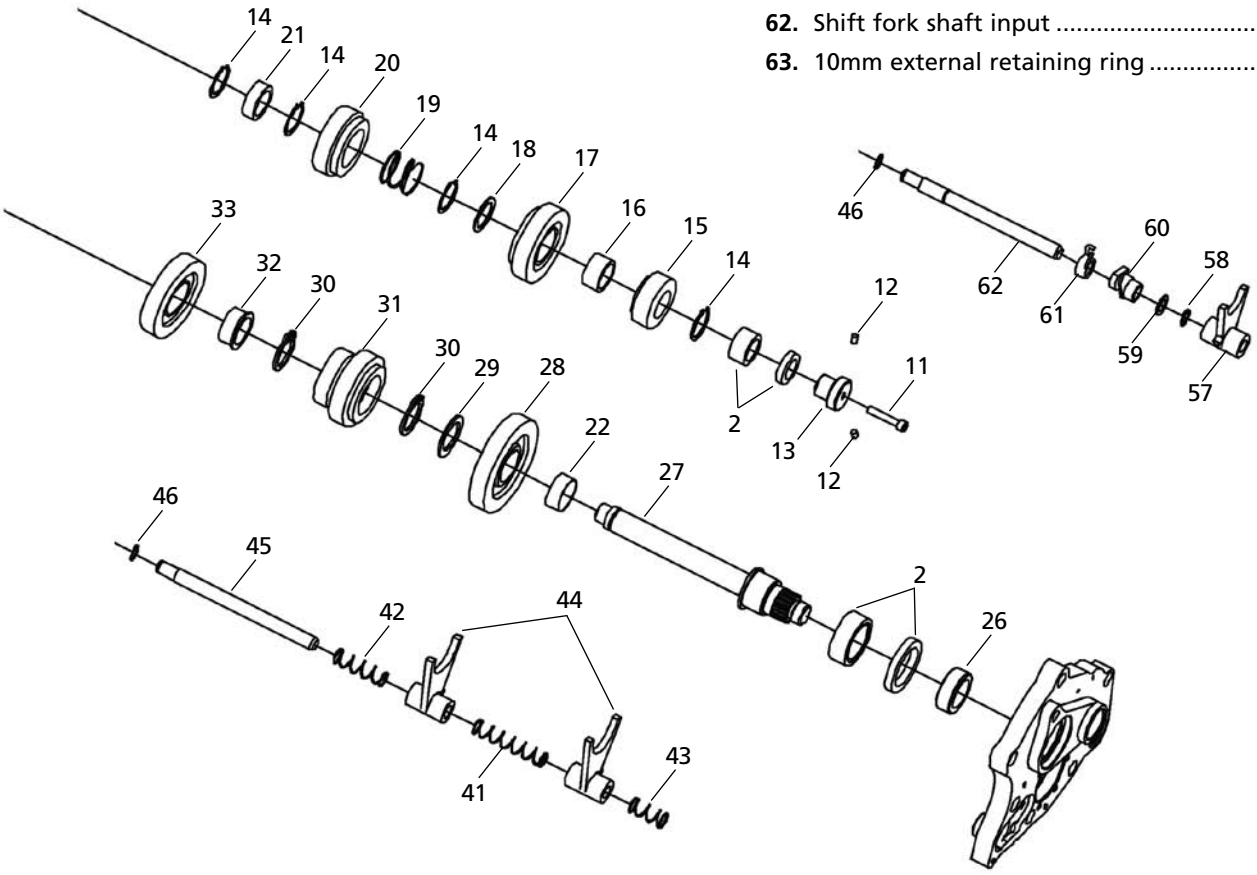
Transmission assembly, with left trap door **56-1100**



S&S BILLET PRO STOCK ENGINE ASSEMBLY – 31-9710

Continued...

16. Splined bushing **56-1036**
17. Sixth gear input, 19 teeth **56-1112**
18. Splined input thrust washer **50-7147**
19. Spring coil **50-8407**
20. Fourth gear input, 18 teeth **56-1111**
21. Gear spacer **56-1117**
22. Third gear input, 18 teeth **56-1110**
23. Bushing, fifth gear input **56-1099**
24. Fifth gear input, 22 teeth **56-1109**
25. Input shaft **56-1021**
26. Spacer, right side output shaft **56-3023**
27. Output shaft **56-1022**
28. Second gear output, 29 teeth, 1.933 ratio **56-1108**
29. Washer, splined output thrust **56-1093**
30. Ring, external retaining, 1.077"diameter x .050" thick **56-1096**
31. Sixth gear output, 20 teeth, 1.053 ratio **56-1107**
32. Bearing, splined-plain *(for #4 gear)* **56-1095**
33. Fourth gear output, 23 teeth, 1.278 ratio **56-1106**
34. Ring, external retaining, 1.093"diameter x .075" thick **56-1094**
35. Third gear output, 27 teeth, 1.500 ratio **56-1105**
36. Fifth gear output, 25 teeth, 1.136 ratio **56-1104**
37. Thrust washer **50-7146**
38. Bearing, plain *(for #1 output gear)* **56-1098**
39. First gear output, 31 teeth, 2.8185 ratio **56-1103**
40. Ring, external retaining, constant cross-section .082"diameter x .050" **56-1097**
41. Spring long **50-5066**
42. Spring medium **50-5064**
43. Spring short **50-5063**
44. Output forks **31-6107**
45. Shift fork shaft out **56-1023**
46. 7/16 Snap ring external fork shafts **50-8210**
47. Pole gear shift no. 1 ..... **31-6071**
48. Pole gear shift no. 2 ..... **31-6072**
49. Shifting pawl roller **31-6106**
50. Spring, shift pawl **11-2147**
51. Gear shift cam **31-6070**
52. Shift drum **56-1020**
53. 25mm external retaining ring **50-8209**
54. Output shaft retaining washer **50-7006**
55. 1/4-28 1" FHCS output shaft **50-0324**
56. Spacer clutch, trans input, pro stock B60 ..... **56-3006**
57. Input forks **31-6108**
58. 1/2" External snap ring **50-8212**
59. 1/2" x .040 thick washer **50-7144**
60. Detent arm **11-2128**
61. Detent arm spring **11-2157**
62. Shift fork shaft input **56-1024**
63. 10mm external retaining ring **50-5061**



Because every industry has a leader